

CLAIMS

1. - A method for loading a fuel assembly (5) into a loading location (3) in the core (1) of a nuclear reactor comprising fuel assemblies (5) of generally right prismatic shape located within an enclosing wall (2), in adjacent right prismatic locations (3) having vertical axes, the transverse cross-sections of which in a horizontal plane form a regular arrangement, the loading location (3) for the fuel assembly (5) comprising at least one vertical lateral surface in relation to which a lateral surface of a fuel assembly adjacent to the fuel assembly (5) being loaded is positioned, characterised in that:

- a dummy assembly (4) having substantially the shape and dimensions of the loading location (3) and having smooth lateral walls substantially over the entire height of the loading location (3) is inserted into the loading location (3),
- the position of the at least one adjacent assembly (5) is fixed in the presence of the dummy assembly (4) with respect to at least a second assembly (5) in the core (1), at least in the upper part of the adjacent assembly (5),
- the dummy assembly is removed from the loading location (3), and
- the fuel assembly (5) which is being loaded is inserted into the loading location (3).

2. - A device for loading a fuel assembly (5) into a loading location (3) in the core (1) of a nuclear reactor comprising fuel assemblies (5) of general right prismatic shape located within an enclosing wall (2) in adjacent prismatic locations (3) having vertical axes whose transverse cross-sections in a horizontal plane constitute a regular arrangement, the

loading location (3) for the fuel assembly comprising at least one vertical lateral surface according to which a lateral surface of a fuel assembly (5) adjacent to the fuel assembly being loaded is positioned, characterised in that it comprises a fuel assembly realignment tool (4) in the form of a dummy assembly having the general right prismatic shape of a location (3) for a fuel assembly (5) in the core and laterally bounded by smooth walls, and

- at least one tool for holding fuel assemblies (11) comprising a supporting plate (12) and positioning pins (14) designed to engage the positioning openings of upper end members (10) of fuel assemblies in the core,
- as well as at least one handling means (15) for gripping and handling the realignment tool for the fuel assemblies (4) and at least one tool for holding the fuel assemblies (11) through suspension and holding means (8, 13).

3. - A device according to claim 2, characterised in that the suspension and holding means (8, 13) of the tool for realigning fuel assemblies (4) and the tool holding fuel assemblies (11) is similar to a suspension and holding part of an upper end member (10) of a fuel assembly (5) for the core and that the handling device of the tool for realigning fuel assemblies (4) and the tool holding fuel assemblies (11) is a gripper (15) of a nuclear reactor loading machine.

4. - A device according to either of claims 2 and 3, characterised in that the tool for realigning fuel assemblies (4) comprises a central body (4a, 4'a), an upper end member (8, 8') and a lower end member (7, 7') having a common longitudinal axis (6, 6') and a transverse cross-section in a plane perpendicular to the axis (6, 6') having

the shape of the transverse cross-section of a location (3) for a fuel assembly in the core of the nuclear reactor.

5. - A device according to claim 4, characterised in that the central body (4a) and the lower end member (7) of the tool for the realignment of fuel assemblies (4) of right prismatic shape has a transverse cross-section having dimensions which are smaller than the dimensions of the transverse cross-section of a location for fuel assemblies in the core, an upper end member (8) whose transverse cross-section has the dimensions of the transverse cross-section of a location for a fuel assembly (5) in the core (1) of the reactor and an intermediate part (9) between the central body and the upper end member (8) bounded by lateral walls which are inclined in relation to the axis (6) of the tool for the realignment of fuel assemblies which has a transverse cross-section of generally increasing dimensions between the central body (4a) and the upper end member (8).

6. - A device according to claim 4, characterised in that the tool for the realignment of fuel assemblies (4') comprises a central body (4'a) of right prismatic shape whose transverse cross-section has the dimensions of the transverse cross-section of a location (3) for a fuel assembly (5) in the core (1) of the reactor and a lower end member (7) having lateral walls inclined in relation to the axis (6') of the tool for the realignment of fuel assemblies in such a way that the transverse cross-section of the lower end member (7') has decreasing dimensions between the central body (4'a) and its lower engaging extremity in a location (3) in the core (1) of the nuclear reactor.

7. - A device according to any one of claims 4, 5 and 6, characterised in that the lower end member (7, 7') of the realignment tool (4) comprises lateral openings (7a) for the passage of positioning pins for a location (3) in the core (1) of the reactor and two posts (26) engaging in the water holes of the location (3) when the realignment tool (4) is positioned on the supporting plate for the core (1) of the reactor.

8. - A device according to any one of claims 4, 5 and 6, characterised in that the lower end member (7) of the realignment tool (4) has a cross-section such that it can be engaged between the positioning pins of a location for a fuel assembly in the core (1) of the reactor and two posts (26') engaging in the water holes of location (3) when the realignment tool (4) is positioned on the supporting plate for the core (1) of the reactor.

9. - A device according to any one of claims 5 to 8, characterised in that the walls inclined with respect to the axis (6, 6') of the intermediate part (9) or the lower end member (7') of the tool for the realignment of fuel assemblies (4, 4') have successive portions (9a, 9b) in the direction of the axis (6, 6') which are inclined with respect to the axis (6, 6') and substantially parallel to the axis (6, 6').

10. - A device according to any one of claims 3 to 9, characterised in that the tool holding the fuel assemblies (11) comprises a supporting plate (12), a first set of positioning fingers (14a) and a second set of positioning fingers (14b) which are parallel to each other and are fixed in arrangements perpendicular to the supporting plate (12),

the positioning fingers (14b) of the second set having a length in the direction perpendicular to the supporting plate (12) which is shorter than the length of the fingers (14a) of the first set.

11. - A device according to claim 10, characterised in that the positioning fingers (14a) of the first set or long fingers comprise a shank having a first longitudinal axis (14'a) and an extremity tip (22) in a prolongation of the shank having a longitudinal axis (22a) which is offset with respect to the axis (14'a) of the shank in a direction perpendicular to the axis of the shank (14'a).

12. - A device according to claim 11, characterised in that the long fingers (14a) of the tool holding fuel assemblies (11) are attached to the supporting plate (12) by mechanical fixing means through which the orientation of a finger (14a) about its longitudinal axis (14'a) and thus the direction of offset between the axis (14'a) of the shank of the finger and (22a) of the extremity tip of the long finger (14a) can be adjusted.

13. - A device according to any one of claims 10 to 12 for loading fuel assemblies of square transverse cross-section in right prismatic locations of square cross-section in the core (1) of a nuclear reactor, characterised in that the fuel assembly holding tool (11) comprises a supporting plate (12) in the shape of a square whose side is substantially equal to twice the side of the transverse cross-section of one location (3) for a fuel assembly (5) in the core (1) of the nuclear reactor, four long fingers (14a) in the positions of positioning holes for the four adjacent fuel assemblies (5) in the core (1) of the nuclear reactor and

four short fingers (14b) of a length shorter than the length of the long fingers in a direction perpendicular to the supporting plate (12) in positions corresponding to the positions in transverse cross-section of four positioning holes for the four adjacent fuel assemblies located on a diagonal on each of the upper end members of the fuel assemblies (5) in relation to the positioning holes in the positions of the long fingers (14a).

14. - A device according to any one of claims 10 to 12, in the case of a core (1) of a nuclear reactor comprising fuel assemblies (5) having a square transverse cross-section positioned in locations (3) of the core of right prismatic shape having square transverse cross-sections arranged in a square grid arrangement, characterised in that the tool holding fuel assemblies (11') comprises a supporting plate (12') in the shape of a square having dimensions corresponding to the dimensions of the transverse cross-sections of the three locations for adjacent fuel assemblies (5) in the core (1), three long pins and three short pins designed to engage respectively the positioning openings of three adjacent fuel assemblies arranged in a square in the core (1) of the nuclear reactor, the long pins being inserted in to the first openings of each of the fuel assemblies and the three short pins being inserted respectively in three second positioning openings for the three fuel assemblies arranged in a square located diagonally with respect to the first openings receiving the long pins.

15. - A device according to any one of claims 10 to 14, characterised in that the fuel assembly holding tool (11, 11') comprises a suspension and holding device (13) similar

to a suspension and holding device of an upper end member (10) of a fuel assembly (5) integral with the supporting plate (12) on one side of the supporting plate (12) opposite a side of the supporting plate (12) on which the positioning pins (14a, 14b) are fixed projectingly.